Six Sigma Overview

Governor's Conference on Workforce Development
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What is Six Sigma?
Can it Help Missouri Businesses?
Where to Start?

Richard Doerr Master Black Belt
&
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**Building Missouri Business
One Success At A Time**

MISSOURI ENTERPRISE
BUSINESS ASSISTANCE CENTER

What is Six Sigma ?

◆ 3.4 defects per million

◆ A systematic, scientific, fact based, data driven problem solving process

◆ Projects are led by Black Belts

◆ Corporate Culture and Structure

What is Six Sigma?

◆ Six Sigma is a Process Capability of 3.4 Defects/Million

◆ Sigma Values

Sigma Values	Percent Acceptable	Defects/Million
➢ $\pm$ 1 Sigma	30.23	697,700
➢ $\pm$ 2 Sigma	69.13	308,700
➢ $\pm$ 3 Sigma	93.32	66,810
➢ $\pm$ 4 Sigma	99.3790	6,210
➢ $\pm$ 5 Sigma	99.976670	233
➢ **$\pm$ 6 Sigma**	**99.999660**	**3.4**

Six Sigma is the Name of the Process not the Target

What is Six Sigma?

◆ Six Sigma is a **systematic**, scientific, fact based, data driven problem solving process

  ➢ Systematic

    ✓ Projects follow the DMAIC process
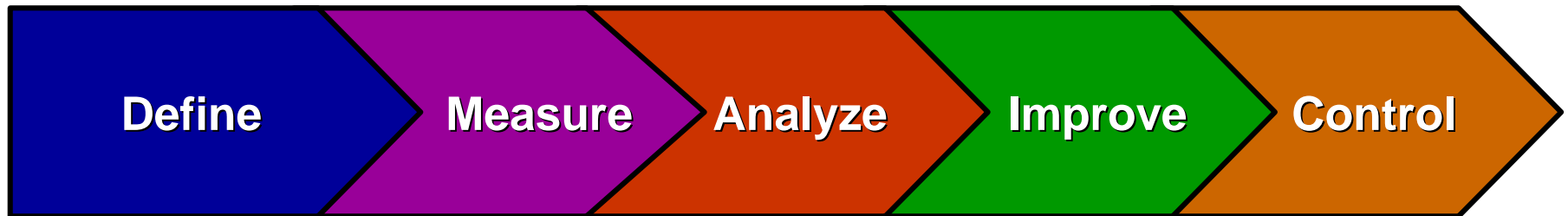
Define	Measure	Analyze	Improve	Control

What is Six Sigma?

◆ Six Sigma is a systematic, **scientific**, fact based, data driven problem solving process

    ➢ Scientific

       ✓ Statistical Analysis is used to test the ideas and solutions

           – DOE (design of experiments)

           – Hypothesis Testing

           – Correlation and Regression

           – Control Charts

$$Y = f(X_1, X_2, X_3, X_4 \ldots)$$

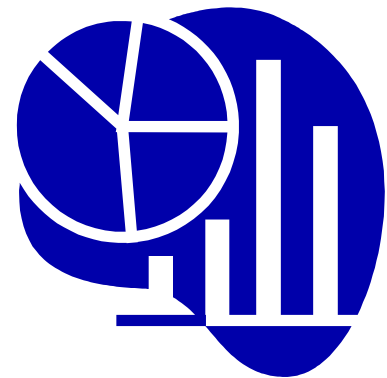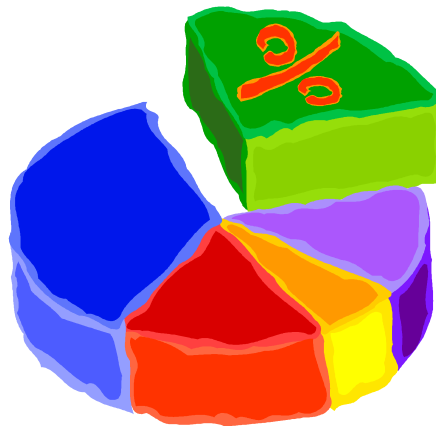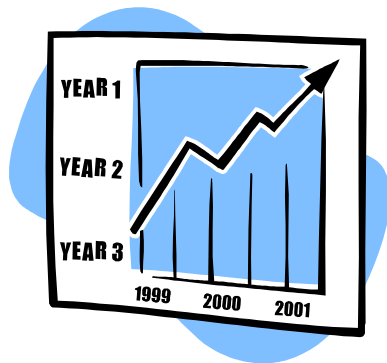**Output**   **Input Variables**   **Process Variables**

What is Six Sigma?

◆ Six Sigma is a systematic, scientific, **fact based**, data driven problem solving process

  ➢ Fact Based

   ✓ Opinions help generate ideas but Decisions are made on Facts

   ✓ Using and insisting on facts can change the culture of a Company

What is Six Sigma?

◆ Six Sigma is a systematic, scientific, fact based, **data driven** problem solving process

  ➢ Data Driven

    ✓ Data defines the Current State of the Project Y

    ✓ Data is used to fine the Root Causes or X's

What is Six Sigma?

◆ Six Sigma is a systematic, scientific, fact based, data driven **problem solving process**

> ➢ What kind of Problems?
>> ✓ Large, Usually more than $150,000 Annual Savings
>> ✓ Cross Functional
>> ✓ Problems affecting Major company Y's
>>> » Market Share
>>> » Growth
>>> » Profitability
>> ✓ Problems that have been worked on before

Black Belts Lead Projects

◆ Leading Six Sigma Projects requires training and experience

◆ Black Belt Certification usually requires;

  ➢ 4 weeks of class room work

  ➢ Passing an Exam

  ➢ Completing one or more projects

◆ Green Belts Certification usually requires;

  ➢ 2 weeks of class room work

  ➢ Passing an Exam

  ➢ Completing a project of their own or assisting a Black Belt

In Martial Arts the Belt Color designates a level of Status
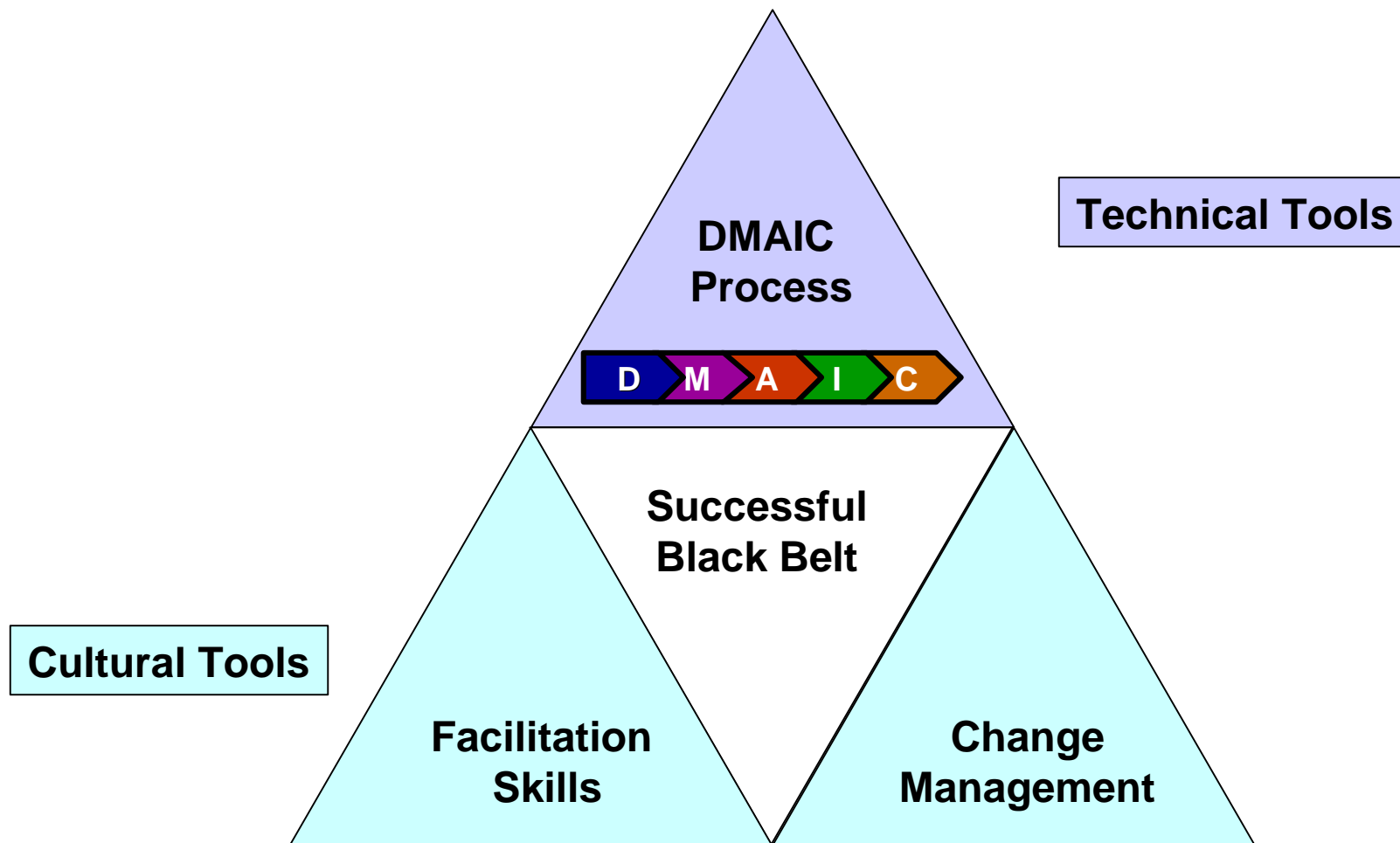
Six Sigma is all about Project Success

$$P_{\text{roject Success}} = f \; (T_{\text{echnical Ability}} \; x \; C_{\text{ultural Acceptance}})$$
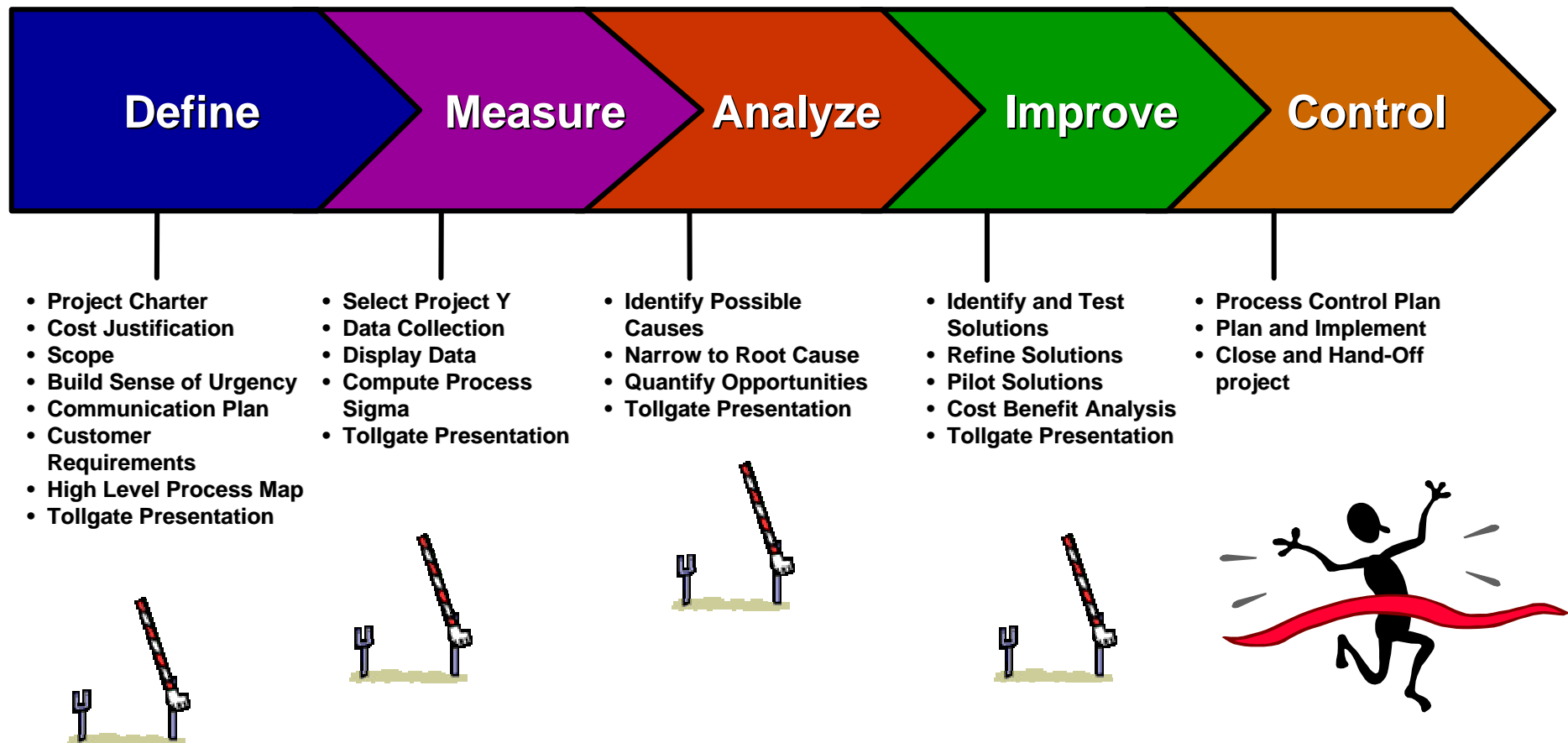
$$P = f \; (T \; x \; C)$$

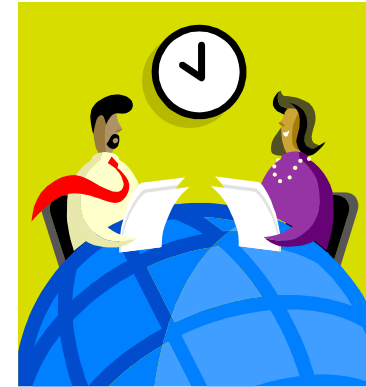Black Belts must have Technical and Cultural Skills

Six Sigma Model for Success

Technical Tools

DMAIC Process

D M A I C

Cultural Tools

Successful Black Belt

Facilitation Skills

Change Management

DMAIC Problem-Solving Tollgate Process

Define	Measure	Analyze	Improve	Control

Define
- Project Charter
- Cost Justification
- Scope
- Build Sense of Urgency
- Communication Plan
- Customer Requirements
- High Level Process Map
- Tollgate Presentation

Measure
- Select Project Y
- Data Collection
- Display Data
- Compute Process Sigma
- Tollgate Presentation

Analyze
- Identify Possible Causes
- Narrow to Root Cause
- Quantify Opportunities
- Tollgate Presentation

Improve
- Identify and Test Solutions
- Refine Solutions
- Pilot Solutions
- Cost Benefit Analysis
- Tollgate Presentation

Control
- Process Control Plan
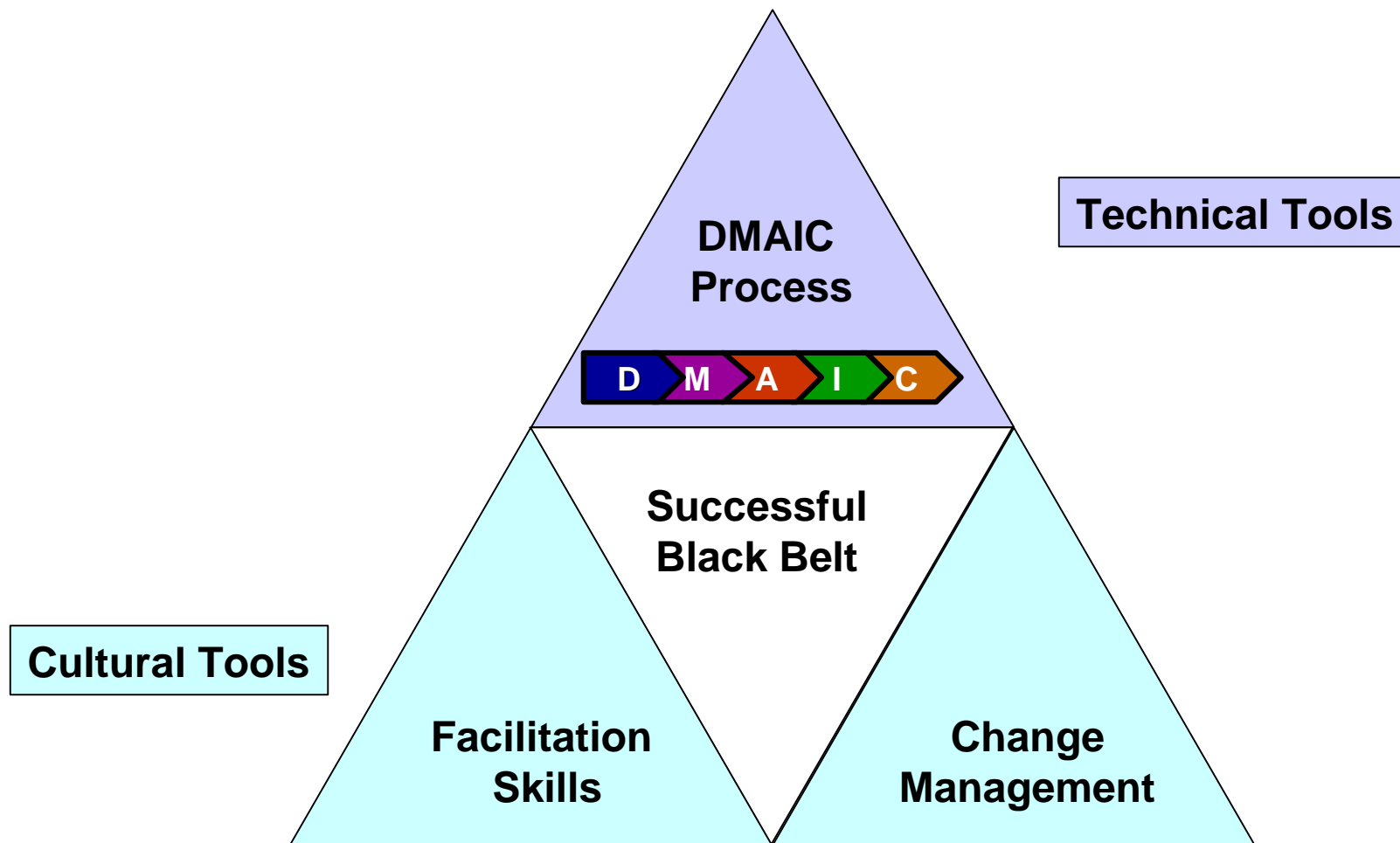- Plan and Implement
- Close and Hand-Off project

Facilitation and Leadership Skills

◆ Setting meeting Ground Rules

◆ Facilitation Skills

  ➢ Giving and Receiving Feedback

  ➢ Listening

  ➢ Deciding

  ➢ Meeting Planning

◆ Process Tools to generate ideas, organize, evaluate and decide
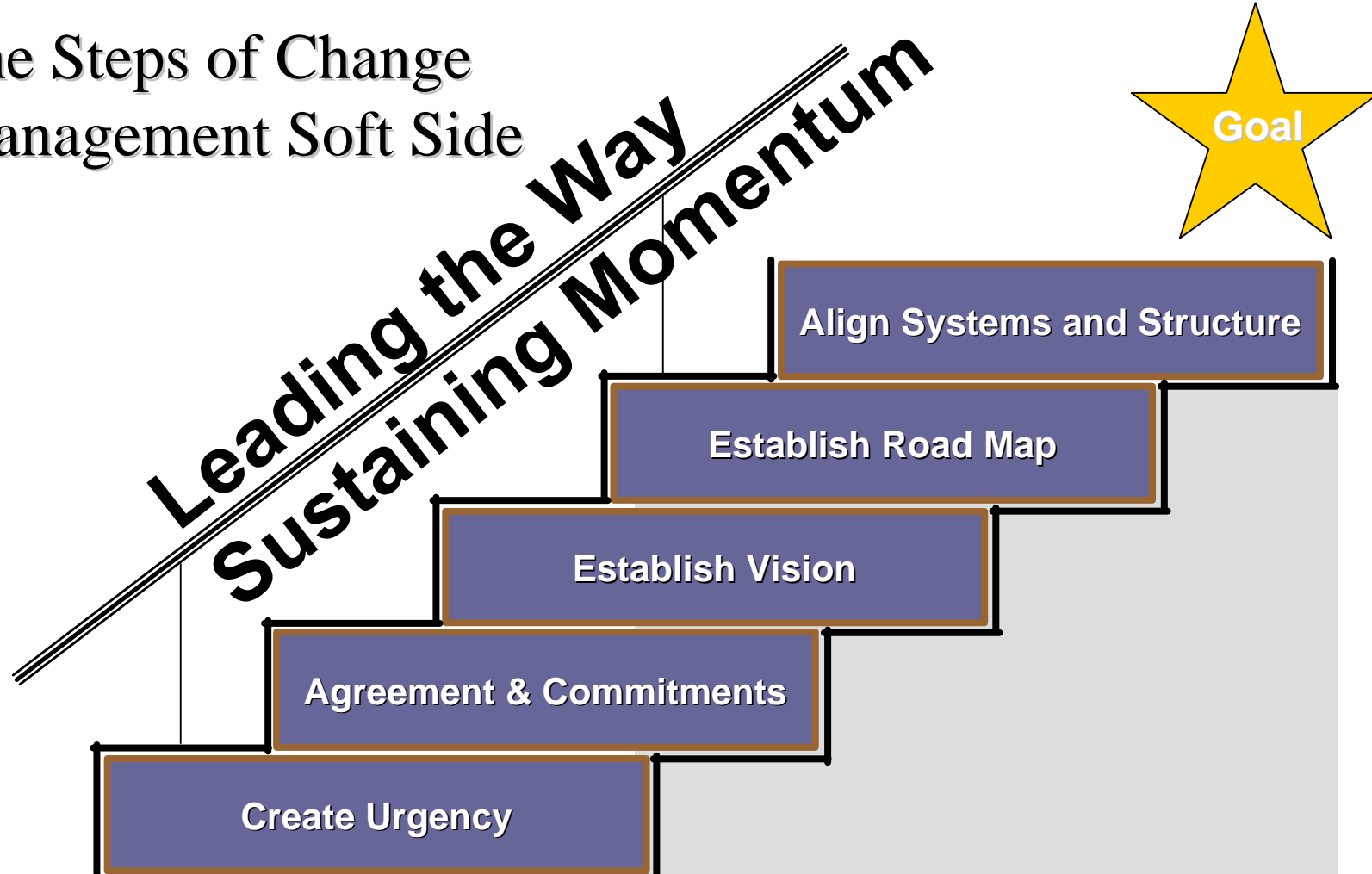
◆ Meeting Interventions

◆ Conflict Resolution

A Great Facilitator makes maximum use of the team's time

Six Sigma Model for Success

DMAIC
Process

D M A I C

Technical Tools

Cultural Tools

Successful
Black Belt

Facilitation
Skills

Change
Management

The Steps of Change Management Soft Side

Leading the Way

Sustaining Momentum

Goal

Align Systems and Structure

Establish Road Map

Establish Vision

Agreement & Commitments

Create Urgency

Current State

Standard Tool Set has Technical and Cultural Tools

Project Proposal And Define Tools

PROJECT PROPOSAL AND SELECTION

Cover

Project Charter

Cost Justification

Project Selection Guide

BUILD YOUR TEAM

In Frame/ Out of Frame

GRPI Checklist

Roles and Responsibilities

Team Members
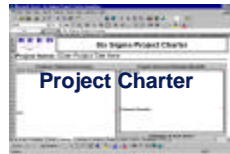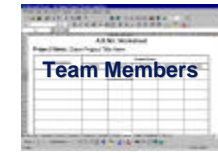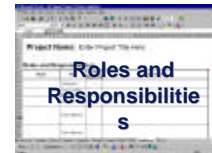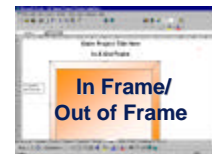
BUILDING A SENSE OF URGENCY

Threat/Opportunity Matrix

More or Less

Elevator Speech

Communication Plan
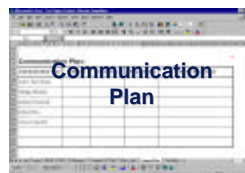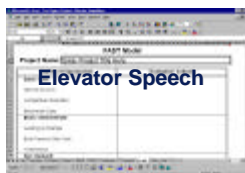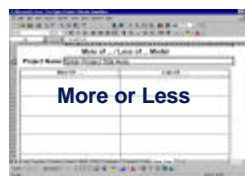
CLARIFY CUSTOMER REQUIREMENTS DEFINE PROCESS

Customer Requirement

Customer Input Guidelines

SIPOC

KANO Analysis
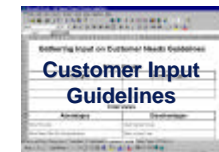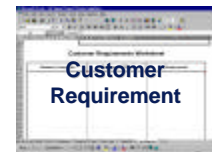
Typical Six Sigma Structure

Executive Six Sigma Council

Vision and Strategy
Provides Resources
Creates the Urgency
Supports the Culture
Monitors Results

Area Deployment Champion

Black Belt for Operations

Black Belt for Administration

Black Belt for Engineering

Project Champion

Project Champion

Project Champion

Cross

Cross

Cross Functional Team

Mentoring for Six Sigma Process
Keeps Project moving
Reports Progress on all Projects
Responsible for Six Sigma Success

Signs Project Charter
Holds Tollgate Meetings
Supports Team with Resources
Responsible for Project Success

The Six Sigma Culture

◆ A Six Sigma Culture will Develop over time

  ➢ How Companies prepare for and run meetings will change

  ➢ More emphasis will be placed on <u>Processes</u> instead of <u>Functional</u> activities

  ➢ A common language will develop

  ➢ The passion to eliminate waste will spread

  ➢ Team members will continue to learn and develop new skills

Why Implement Six Sigma
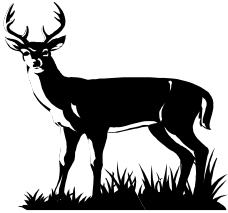
Every morning in Africa, a gazelle wakes up. It knows it must run faster than the fastest lion or it will be killed. Every morning a lion wakes up. It knows it must outrun the slowest gazelle or it will starve to death.

It doesn't matter whether you are a lion or a gazelle—when the sun comes up, you had better be running.
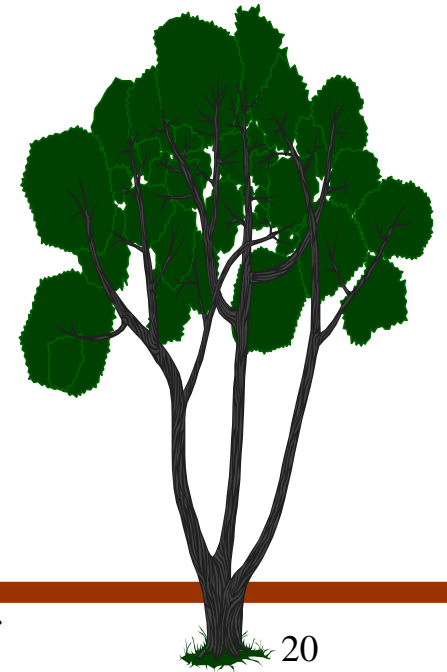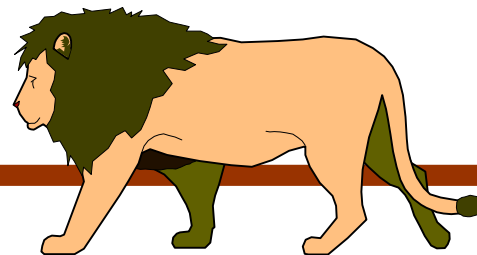
The Most Important Reason
To Implement Six Sigma

Who Is Using Six Sigma?

◆ Motorola

◆ GE

◆ Bombardier

◆ Polaroid

◆ Sony

◆ Invensys

◆ Danon

◆ Target

◆ Ford Motor Co.

◆ Johnson Controls

◆ Lear

◆ Navistar

◆ Dana Corp

◆ 3M

◆ Bank of America
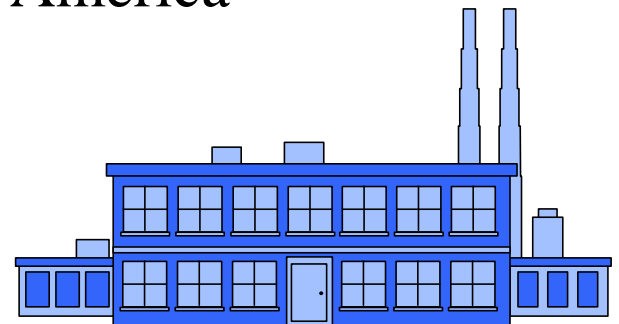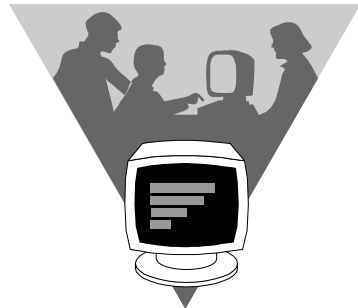
Six Sigma Results

Company	Savings	Duration
Motorola	$2.2B	2.6 Yrs
GE	$1.1B	9 months
ABB	$900M	1 Yr
Texas Instrument	$600M	1.8 Yrs

Data Source: Six Sigma Associates Tempe, Arizona

◆ Bank of America increased bottom line by $2.5 Billion with reduced Expense and Increased profit from additional revenue.

Manufacturing Projects

- ◆ Field Returns
- ◆ Cycle Time Reduction
- ◆ In Process Waste
- ◆ Scrap Reduction
- ◆ Downtime
- ◆ Maintenance / Repair
- ◆ Labor
- ◆ Freight
- ◆ Incoming Material Inspection

WASTED OPPORTUNITIES

RIGHT FIRST TIME
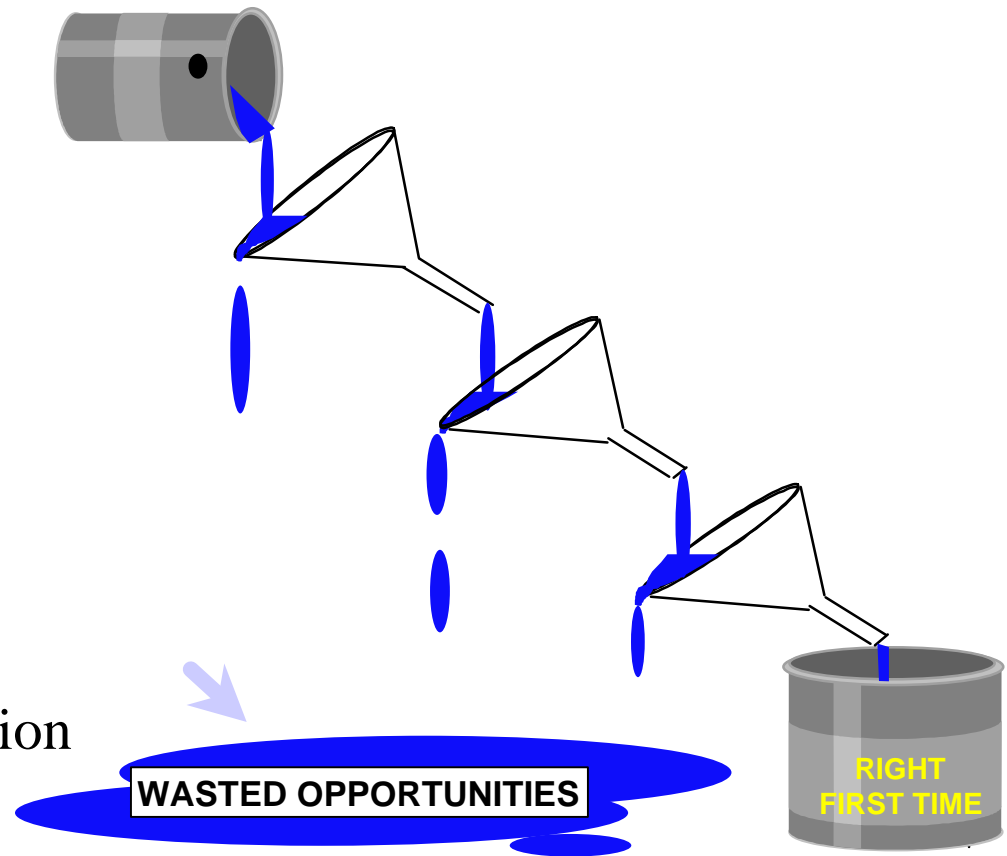
Transactional Projects

- ◆ Customer Request For Quotes
- ◆ Order Handling
  - ➤ Order Errors / Customer Returns
  - ➤ Order Administration & Cycle Time
- ◆ Accounts Receivable
- ◆ Engineering Changes
- ◆ Drawing Releases
- ◆ Product Costing / Pricing
- ◆ Software Defects

How Should Missouri Companies Start

◆ Top Level Management attends a Six Sigma Executive Overview
  ✓ Understands the commitment and makes a decision to proceed
◆ An Executive Six Sigma Council is established
  ✓ Potential Six Sigma Project are defined
  ✓ Project Champions are selected
  ✓ Black Belts are selected
◆ Black Belts are trained and leave their current position
◆ Champions are trained
◆ Everyone in the company receive a 2 hour Awareness Training
◆ Additional Black Belts and Green Belts are Trained

These Steps are Critical to Success.
Sending a few Individuals to Black Belt Training is not enough

Executive Six Sigma Council Responsibilities

- ◆ Selecting the initial Projects

- ◆ Selecting A Deployment Champion

- ◆ Identifying Project Champions

- ◆ Identifying Black Belt Candidates

Typical Six Sigma
Executive Overview Training

Description	Participants involved in this course will learn about the Six Sigma concepts and how to begin executing them in their company. This class will include an overview of the Six Sigma DMAIC process, roles and responsibilities of the management team, champions, process owners, black belts and green belts. Typical results of Six Sigma programs will also be discussed.
Prerequisites	None
Audience	All company executives and middle management.
Course Length	One day: 8:30am – 5pm
Class Size	**Minimum: 5** **Maximum: 20**
Objectives	Participants will be able to internalize the concepts of Six Sigma and to begin executing those concepts in their organization. This course will prepare executives and management personnel for the change in corporate culture that results from the implementation of Six Sigma.
Net Cost	Depends on group size, facilities cost and location Available at Company's facility

Six Sigma Black Belt

◆ **Prerequisites**

➢ **Approved Project** - Each Black Belt Student will need a project that has been approved by the assigned project Champion.

➢ **Computer Literacy** - Must be skilled in word, excel and power point.

➢ **Lap Top Computer** - Must have a lap top pc with Mini Tab installed

➢ **Strong Math and Problem Solving Abilities** – This class will build and develop these skills but a solid understanding of math and the ability to work through problems is very helpful.

➢ **High Potential Employee** - Candidates for Black Belt should have a good track record of success, motivation and a positive attitude. They should be employees that are considered promotable. The Black Belt position is a great opportunity to develop future company leaders.

➢ **Full Time Position** - The Black Belt position is a full time job

Typical Six Sigma Black Belt Course Description

Week 1:	Week 2:

Week 1:
Introduction to Six Sigma
Facilitation Fundamentals
    Tools and Skills
    Practice Meetings
    Conflict Management
Change Management
    Shared Vision
    Building Coalitions and Commitment
    Focus and Vision
    Sustaining Momentum and Transition Road Map
DMAIC Overview
Systems and Structures
Project Selection and Charter
Project Template and Tollgate Process
Basic Statistics with Mini Tab
Variation is the Culprit
	Week 2:
	Define, Measure and Analyze
	    Customers and Requirements
	    Process Mapping
	    Collecting Data
	Basic Statistics
	    Analyze Variations
	    Graphic Analysis
	    Process Sigma
	    Root Cause Analysis
	        Cause & Effect, Five Whys/Structured Tree, Scatter,
	        Correlation and Regression
	        Multi Variable Charts & Pivot Tables
	Process Analysis
	    Sub Process Map
	    Value Added Analysis
	Project Reviews and Expectations for Next Class

Week 3:
Statistical Analysis
    Assessing Normality
    Hypothesis Testing
        Chi Squared, T-Test, Anova
    Design of Experiments
        Full, Fractional and Screening
    Screening Potential Causes
        Regression, Control Charts
Quality Function Deployment
Design for Six-Sigma
    GD&T, DFM/A, DFX
Gauge R&R
Project Reviews and Expectations for Next Class
	Week 4:
	Improve and Control
	    Solution Generation & Selection
	    Bench Marking
	    Process Mapping
	    Cost Benefit Analysis
	    Error Proofing, FMEA
	    Implementation Plan
	    Piloting
	    Establish Measures
	    Monitoring the Plan
	    Validating Measure System
	    Transfer Knowledge
	    Celebrate Accomplishment
	Continuous Improvement
	Lean Practices & Value Added Analysis

Six Sigma <u>Deployment</u> Champion

- ◆ Mentor for Black Belts

- ◆ Keeps Projects moving

- ◆ Reports Progress on all Projects

- ◆ Responsible for the Success of Six Sigma

- ◆ Reports financial progress to the Executive Council

The Deployment Champion should be a Master Black Belt

Six Sigma <u>Project</u> Champion

◆ The Project Champion plays a very important part in the process.

  ➢ Oversees the Black Belts and their projects

  ➢ Sits in tollgate reviews at each phase of the project

  ➢ Breaks down barriers

  ➢ Helps obtain resources

Typical Six Sigma
Project Champion Training

Description	Participants will be given an overview of the DMAIC process and tools with emphasis on what Champions need to be looking for at the end of each tollgate phase.
Prerequisites	None
Audience	Champions and potential Champions.
Course Length	Two days: 8:30am – 5pm
Class Size	**Minimum: 5 Maximum: 20**
Objectives	Champions will be able to conduct in-depth tollgate review after each phase of the project. They will clearly understand their role and responsibility in the Six Sigma process.
Net Cost	Depends on group size, facilities cost and location Available at Company's facility

Awareness Training for Everyone in the Company

◆ Black Belts have been selected

◆ Teams have been formed

◆ It is now time to train everyone

➤ Awareness Training supports the cultural change and helps the Six Sigma project teams.

➤ Black Belt students often teach this introduction to Six Sigma.

Typical Six Sigma
Awareness Training

Description	This class gives a high level overview of Six Sigma, the related roles and responsibilities, project selection and the DMAIC process.
Prerequisites	None
Audience	Every employee of a company implementing Six Sigma
Course Length	2 hours
Class Size	**Minimum: 5** **Maximum: 25**
Objectives	Teach the Six Sigma culture and prepare everyone to be a productive team member on Six Sigma projects.
Net Cost	Depends on group size, facilities cost and location Available at Company's facility

Any Questions

◆ **What is Six Sigma?**

  ➢ 3.4 defects per million
  ➢ Six Sigma is a systematic, scientific, fact based, data driven problem solving process
  ➢ Projects are led by Black Belts
  ➢ Corporate Culture and Structure

◆ **Why Should Missouri Companies Deploy Six Sigma**

  ➢ Who is using it
  ➢ What are the Results

◆ **How To Start the Deployment Process**

  ➢ Executive Overview
  ➢ Black Belt Training
  ➢ Champion Training
  ➢ Awareness Training

Missouri Enterprise Instructor

Richard Doerr

- ➤ Master Black Belt
- ➤ Green Belt Training with GE Capital
- ➤ Black Belt Training with Destra
- ➤ Master Black Belt Certification From Breed Technologies
- ➤ Deployed Six Sigma for Breed Technologies Sales, Marketing, Admin, IT and Electronics Division
- ➤ Mentored 11 Black Belts and 18 Green Belts
- ➤ Mentored 36 projects, 14 to competition
- ➤ Trainer for 4 Groups of Black Belts
- ➤ BSME and MSEM University of Missouri Rolla
- ➤ Vice President of Engineering Breed Technologies, Steering and Electronics
- ➤ Division Chief Engineer Federal Mogul Light, Electronics and Fuel Systems
- ➤ Chief Engineer Carter Automotive Division of ACF Industries

Missouri Enterprise Instructors

John S. W. Fargher, Jr., Ph.D.

➢ John has over 31 years of engineering and management experience as a manufacturing system integration engineer, manufacturing manager, product design engineer, project / program manager, Professor of Project / Program Management, chief financial officer / chief information officer (CFO/CIO), business manager, and independent consultant.

➢ BS, Engineering Science – Montana College of Mineral Science and Technology

➢ Master of Engineering, Industrial Engineering – Texas A&M University

➢ MS, Systems Management (Logistics Option) – University of Southern California

➢ Ph. D., Industrial Engineering (Production and Manufacturing Engineering) – North Carolina State University

➢ Conference Chair for the 2000 thru 2004 Lean Management Solutions Conference,

➢ Judge, Florida Governor's Sterling Quality Award

➢ Director, Lean Division, Institute of Industrial Engineers (IIE)

➢ Fellow, IIE

➢ Eight books and over 50 professional papers on project management, cost accounting / activity-based cost accounting, remanufacturing, production planning, total quality management, strategic / business planning, and management implementation of change management

➢ Six Sigma Black Belt